

VACON®
AC DRIVES

CANOPEN OPTION BOARD OPTE6 USER MANUAL

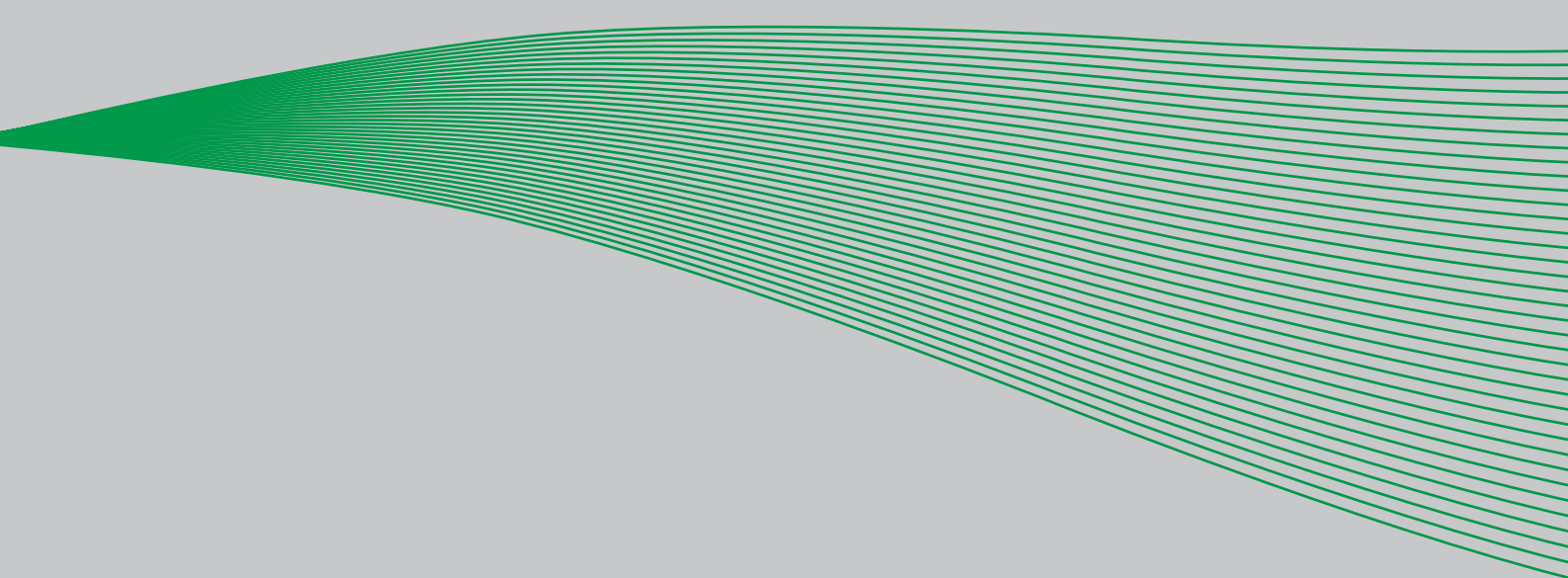


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1. SAFETY

This manual contains clearly marked cautions and warnings that are intended for your personal safety and to avoid any unintentional damage to the product or connected appliances.

Please read the information included in cautions and warnings carefully.

The cautions and warnings are marked as follows:

Table 1. Warning signs

	= DANGER! Dangerous voltage
	= WARNING or CAUTION
	= Caution! Hot surface

1.1 DANGER



The **components of the power unit are live** when the drive is connected to mains potential. Coming into contact with this voltage is **extremely dangerous** and may cause death or severe injury.



The **motor terminals U, V, W and the brake resistor terminals are live** when the AC drive is connected to mains, even if the motor is not running.



After disconnecting the AC drive from the mains, **wait** until the indicators on the keypad go out (if no keypad is attached, see the indicators on the cover). Wait 5 more minutes before doing any work on the connections of the drive. Do not open the cover before this time has expired. After expiration of this time, use a measuring equipment to absolutely ensure that no voltage is present. **Always ensure absence of voltage before starting any electrical work!**



The control I/O-terminals are isolated from the mains potential. However, the **relay outputs and other I/O-terminals may have a dangerous control voltage** present even when the AC drive is disconnected from mains.



Before connecting the AC drive to mains make sure that the front and cable covers of the drive are closed.



During a ramp stop (see the Application Manual), the motor is still generating voltage to the drive. Therefore, do not touch the components of the AC drive before the motor has completely stopped. Wait until the indicators on the keypad go out (if no keypad is attached, see the indicators on the cover). Wait additional 5 minutes before starting any work on the drive.

1.2 WARNINGS



The AC drive is meant for **fixed installations only**.



Do not perform any measurements when the AC drive is connected to the mains.



The **earth leakage current** of the AC drives exceeds 3.5mA AC. According to standard EN61800-5-1, **a reinforced protective ground connection** must be ensured. See Chapter 1.3.



If the AC drive is used as a part of a machine, the **machine manufacturer is responsible** for providing the machine with a **supply disconnecting device** (EN 60204-1).



Only **spare parts** delivered by Vacon can be used.



At power-up, power brake or fault reset **the motor will start immediately** if the start signal is active, unless the pulse control for Start/Stop logic has been selected. Furthermore, the I/O functionalities (including start inputs) may change if parameters, applications or software are changed. Disconnect, therefore, the motor if an unexpected start can cause danger.



The **motor starts automatically** after automatic fault reset if the auto restart function is activated. See the Application Manual for more detailed information.



Prior to measurements on the motor or the motor cable, disconnect the motor cable from the AC drive.



Do not touch the components on the circuit boards. Static voltage discharge may damage the components.



Check that the **EMC level** of the AC drive corresponds to the requirements of your supply network.

1.3 EARTHING AND EARTH FAULT PROTECTION



CAUTION!

The AC drive must always be earthed with an earthing conductor connected to the earthing terminal marked with

The earth leakage current of the drive exceeds 3.5mA AC. According to EN61800-5-1, one or more of the following conditions for the associated protective circuit must be satisfied:

- a) The protective conductor must have a cross-sectional area of at least 10 mm² Cu or 16 mm² Al, through its total run.
- b) Where the protective conductor has a cross-sectional area of less than 10 mm² Cu or 16 mm² Al, a second protective conductor of at least the same cross-sectional area must be provided up to a point where the protective conductor has a cross-sectional area not less than 10 mm² Cu or 16 mm² Al.
- c) Automatic disconnection of the supply in case of loss of continuity of the protective conductor.

The cross-sectional area of every protective earthing conductor which does not form part of the supply cable or cable enclosure must, in any case, be not less than:

- 2.5mm² if mechanical protection is provided or
- 4mm² if mechanical protection is not provided.

The earth fault protection inside the AC drive protects only the drive itself against earth faults in the motor or the motor cable. It is not intended for personal safety.

Due to the high capacitive currents present in the AC drive, fault current protective switches may not function properly.



Do not perform any voltage withstand tests on any part of the AC drive. There is a certain procedure according to which the tests must be performed. Ignoring this procedure can cause damage to the product.

NOTE! You can download the English and French product manuals with applicable safety, warning and caution information from www.vacon.com/downloads.

REMARQUE Vous pouvez télécharger les versions anglaise et française des manuels produit contenant l'ensemble des informations de sécurité, avertissements et mises en garde applicables sur le site www.vacon.com/downloads.

2. CANOPEN OPTION BOARD OPTE6 - GENERAL

2.1 OVERVIEW

OPTE6 is a CANopen adapter board for Vacon-manufactured frequency converters. The board allows the frequency converter to be controlled by using the CANopen protocol. The board implements the frequency converter profile with the velocity mode.

The option board firmware implements the following protocol specifications:

- **CiA-301** CANopen communication specification version 4.2
- **CiA-402** CANopen Profile for Drives and Motion Controller version 3.2
 - Device: frequency converter
 - Operation mode: velocity mode
- **CiA-303-3** CANopen indicator specification, implemented by using 2 CANopen status led indicators

2.2 SOFTWARE

2.2.1 CAN

The CAN data link layer protocol is standardised in ISO 11898. The standard describes mainly the data link layer composed of the logical link control (LLC) sub layer and the media access control (MAC) sub layer, and some aspects of the physical layer of the OSI reference model.

2.2.2 CANOPEN

CANopen is an application layer protocol on top of the CAN bus.

The protocol specification describes:

- Set of bit rates to support
- Network Management (NMT)
- Service data transmission (SDO)
- Process data transmission (PDO)
- Error message transmission (EMCY)
- Node status monitoring (heartbeat and node guarding)
- Identity information
- Parameter saving and restoring

2.3 CANOPEN PROTOCOL DESCRIPTION

2.3.1 NMT

NMT network management manages CANopen, and is a mandatory, common feature for all devices. The protocol describes several node control services and the state machine.

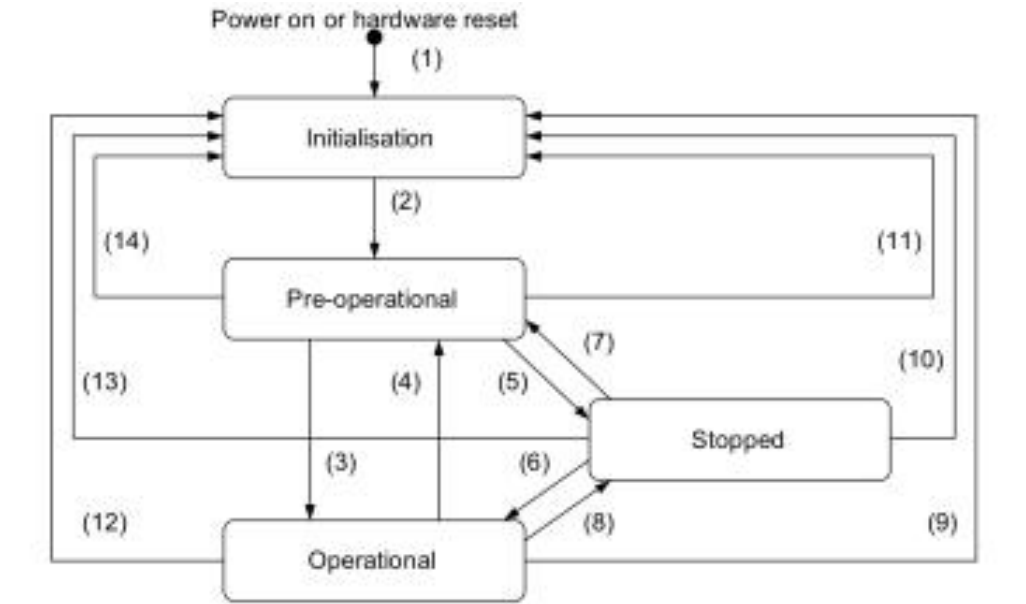


Figure 1. NMT state machine

1 = When the power is on, the NMT state is entered autonomously

2 = The NMT state initialisation is finished, the NMT pre-operational state is entered automatically

3 = NMT service starts with remote node indication or by local control

4 and 7 = NMT service enters pre-operational indication

5 and 8 = NMT service stops remote node indication

6 = NMT service starts remote node indication

9, 10 and 11 = NMT resets node indication

12, 13 and 14 = Indication of NMT service reset communication

Boot-up protocol

After a node starts, it will enter automatically into the pre-operational state. Always when this transition occurs, a boot-up message is sent into the bus.

Table 2: Boot-up message

CAN ID	LENGTH	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7
0x700 + Node ID	1	0							

2.3.1.1 Node control protocols

Protocol start remote node

The start remote node message sets the node(s) into operational state. See Figure 1. NMT state machine. If the node ID in the message is set to '0', the message affects all nodes (broadcast).

Table 3: Start remote node message

CAN ID	LENGTH	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7
0x0	0x2	0x1	NODE ID						

Protocol stop remote node

The stop remote node message sets the node(s) into stopped state. See Figure 1 NMT state machine. If the node ID in the message is set to '0', the message affects all nodes (broadcast). When the node is in stopped state, it will not answer to SDO or PDO messages.

Table 4: Stop remote node message

CAN ID	LENGTH	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7
0x0	0x2	0x2	NODE ID						

Protocol enter pre-operational

The enter pre-operational message sets the node(s) into pre-operational state. See Figure 1. NMT state machine. If the node ID in the message is set to '0', the message affects all nodes (broadcast). When the node is in pre-operational state, it will not answer to PDO messages.

Table 5: Enter pre-operational message

CAN ID	LENGTH	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7
0x0	0x2	0x80	NODE ID						

Protocol reset node

The reset node message makes the node(s) apply application reset. See Figure 1. NMT state machine. Application reset sets the whole object dictionary back to the default or previously saved values. If the node ID in the message is set to '0', the message affects all nodes (broadcast). After the node has made the application reset, it will enter the pre-operational state automatically from the initialising state. This also creates a boot-up event and the boot-up message is sent after the reset.

Table 6: Reset node message

CAN ID	LENGTH	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7
0x0	0x2	0x81	NODE ID						

Protocol reset communication

The reset communication message makes the node(s) apply communication reset. See Figure 1. NMT state machine. Communication reset does not affect the object dictionary values. If the node ID in the message is set to '0', the message affects all nodes (broadcast). After the node has made the communication reset, it will enter the pre-operational state automatically from the initialising state. This also creates a boot-up event and the boot-up message is sent after the reset.

Table 7: Reset communication message

CAN ID	LENGTH	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7
0x0	0x2	0x82	NODE ID						

2.3.1.2 Error control protocols

Heartbeat Protocol

Heartbeat protocol defines the producer and consumer. Consumer node sends its NMT status that is then available for any consumer node. The consumer node is the receiver of heartbeat messages. The producer node has a timing parameter that indicates how often the heartbeat message should be sent. The consumer node has a relative parameter that indicates how often the heartbeat message should be received. If the consumer does not receive the heartbeat message within the time defined in the heartbeat object entry, an error event occurs.

Table 8: Node status description

Value	Description
0x0	Boot-up
0x4	Stopped
0x5	Operational
0x7F	Pre-operational

Table 9: Heartbeat message

CAN ID	LENGTH	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7
0x700 + Node ID	0x1	Status							

Table 10: Heartbeat-related objects in OD

Index	Description
0x1016	Consumer heartbeat time
0x1017	Producer heartbeat time
0x1029	Error behaviour

Node guarding protocol

Node guarding protocol is a NMT master driver protocol, where the master sends a remote transmission request, which is answered by the slave. The slave response includes one data byte that consists of a NMT slave state, and a toggle bit that toggles every response.

NOTE! The CiA application note 802 recommends that the node guarding protocol should not be used, because of different handling of RTR frames in CAN controllers.

OPTE6 option board does not have a hardware-triggered automatic response to the RTR frame. RTR information is handled by software, and the response data always consists of updated information.

Table 11: Node guarding RTR frame (remote request)

CAN ID	LENGTH	RTR	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7
0x700 + Node ID	0x0	1								

Table 12: Node guarding response

CAN ID	LENGTH	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7
0x700 + Node ID	0x1	t	Status						

Table 13: Node guarding slave status

Status	
Value	Description
0x4	Stopped
0x5	Operational
0x7F	Pre-operational

Table 14: Node guarding related objects in OD

Index	Description
0x100C	Guard time
0x100D	Life time factor

2.3.2 EMCY OBJECT

Option board works as an EMCY producer. The EMCY object is transmitted when a fault occurs in the drive or option board. To switch off the EMCY producer, disable the EMCY COB-id by writing MSB bit to 1 (object 0x1014).

When an error occurs, the EMCY message is transmitted with the current value of the error register and the error code is inserted into the pre-defined error field list. The newest error code is always the first sub-index on the error field list. When all active errors are cleared, an empty EMCY object is transmitted.

If a drive-internal fault occurs, the MSEF field contains the drive fault code. See the frequency controller application and user manual for possible fault codes.

Table 15: EMCY message

CAN ID	LENGTH	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7
0x80 + Node ID	0x8	EEC		ER	MSEF				

Table 16: EMCY message data fields

EEC	Emergency error code
ER	Error register value
MSEF	Manufacturer-specific error code

Table 17: EMCY-related objects in OD

Index	Description
0x1001	Error register
0x1003	Pre-defined error field list
0x1014	EMCY object COB-ID

NOTE! When a drive-internal error occurs, the emergency error code is always 'Generic error'.

2.3.3 SDO PROTOCOL

The Option board contains one SDO server. The SDO protocol provides a direct access to the object entries of the object dictionary of the CANopen device. Each message is acknowledged by the server. The protocol is mostly used to set and read parameters from the object dictionary at the pre-operational state. Some objects have limitations for SDO usage at the operational state.

Up to four bytes can be transferred by using the expedited transfer, where the data fits into one CAN message. For bigger than 4-byte object sizes, segmented transfer must be used. Optionally, block transfer is also possible with bigger data types. Block transfer is most efficient with big data sizes.

Table 18: SDO-related objects in OD

Index	Description
0x1200	SDO server parameter object

2.3.4 PDO PROTOCOL

Process data objects PDOs are used to transmit real-time data with no protocol overhead. Each PDO has its mapping and communication parameter record.

There are two different types of PDOs. Transmit PDOs for producing data into network and Receive PDOs for consuming data from network. OPTE6 board consist totally 3 receive and 3 transmit PDOs.

Table 19: PDO-related objects in OD

Index	Description
0x1400	1st rxPDO communication parameter record

Table 19: PDO-related objects in OD

0x1401	2nd rxPDO communication parameter record
0x1402	3rd rxPDO communication parameter record
0x1600	1st rxPDO mapping parameter record
0x1601	2nd rxPDO mapping parameter record
0x1602	3rd rxPDO mapping parameter record
0x1800	1st txPDO communication parameter record
0x1801	2nd txPDO communication parameter record
0x1802	3rd txPDO communication parameter record
0x1A00	1st txPDO mapping parameter record
0x1A01	2nd txPDO mapping parameter record
0x1A02	3rd txPDO mapping parameter record

2.3.4.1 PDO communication parameter record

PDO communication parameter record defines the COB-id, transmission type and how often the PDO is transmitted. The fields can be modified during the pre-operational state.

Table 20: PDO communication parameter record

Indexes	Sub-index	Name	Data type	RX PDO	TX PDO
0x1400 0x1401 0x1402 0x1800 0x1801 0x1802	0	Highest sub-index supported	UNSIGNED8	ro	ro
	1	COB ID	UNSIGNED32	r/w	r/w
	2	Transmission type	UNSIGNED8	r/w	r/w
	3	Inhibit time	UNSIGNED16	ro	r/w
	4	Reserved	UNSIGNED8	ro	ro
	5	Event timer	UNSIGNED16	r/w	r/w
	6	SYNC start value	UNSIGNED8	Not available	r/w

2.3.4.2 COB ID

COB ID determines whether the PDO is valid (active) and using 11-bit or 29-bit frames. troller application and user manual for possible fault codes.

Table 21: COB ID

31	30	29	28	11	10	0
Valid	Reserved	Frame	0x00000		11-bit CAN-ID	
			29-bit CAN-ID			

Table 22: COB ID data fields

Bit(s)	Value	Description
Valid	0	PDO exists / enabled
	1	PDO does not exist / disabled
Reserved	x	Not applicable
Frame	0	11-bit CAN-ID valid
	1	20-bit CAN-ID valid
29-bit CAN-ID	x	29-bit CAN-ID of the CAN extended frame
11-bit CAN-ID	x	11-bit CAN-ID of the CAN base frame

2.3.4.3 Transmission type

Table 23: PDO transmission types

Value	Description	Receive PDO	Transmit PDO
0x00	Synchronous (acyclic)	X	X
0x01	Synchronous (cyclic every sync)	X ₁	X
0x02	Synchronous (cyclic every 2 nd sync)	X ₁	X
0x03	Synchronous (cyclic every 3 rd sync)	X ₁	X
0x04	Synchronous (cyclic every 4 th sync)	X ₁	X
...	...	X ₁	X
0xF0	Synchronous (cyclic every 240 th sync)	X ₁	X
0xF1	Reserved	-	-
...	...	-	-
0xFB	Reserved	-	-
0xFC	RTR-only (synchronous)	-	X
0xFD	RTR-only (Event-driven)	-	X
0xFE	Event-driven (manufacturer-specific)	X	X
0xFF	Event-driven (device and application profile)	X	X

¹ For receive PDO, each sync transmission mode equals the same. Each sync always activates the latest received PDO value.

Synchronous means that the PDO is transmitted after the SYNC. The CANopen device starts sampling the data with the reception of the SYNC. If the transmission mode of the PDO is acyclic, the CANopen device gives an internal event, the sampling starts with the next SYNC and the PDO is transmitted afterwards. If the transmission mode is cyclic, the sampling starts with the reception of every SYNC, every second SYNC, every third SYNC etc. depending on the given value, and the PDO is transmitted afterwards.

RTR-only means that the PDO is requested via RTR. If the transmission mode of the PDO is synchronous, the CANopen device starts sampling with the reception of every SYNC and will buffer the PDO. If the mode is event-driven, the CANopen device starts the sampling with the reception of the RTR and transmits the PDO immediately.

Event-driven means that the PDO can be transmitted at any time based on the occurrence of the internal event of the CANopen device. An event that triggers the OPTE6 transmission occurs when the data mapped into the PDO is changed. Also, an event timer can be used to create transmit events.

Inhibit time

For transmit PDOs, the inhibit time defines the minimum transmission interval, when 0xFE or 0xFF transmission types are selected. For receive PDOs, the inhibit time is disabled. The inhibit time is 16bit unsigned value that is given as multiple of 100µs. Zero value means that the inhibit time is disabled.

Event timer

For a transmit PDO event, the timer defines the maximum interval between the transmissions, if the transmission type is set to 0xFE or 0xFF.

For a receive PDO event, the timer activates the deadline monitoring. The deadline monitoring is activated at the first received PDO. If the time between the after the last PDO received is longer than defined in the event timer, a fault will occur.

Event timer is 16bit unsigned value that is given as multiple of 1ms. Zero value means that the event timer is disabled.

Sync start value

Sync start value gives the possibility to compensate network peak traffic in case of sync transmission mode. If the sync start value is zero, the normal sync behaviour for the PDO is used. If the sync start value is greater than zero, the PDO waits for the SYNC message that contains the counter value. When the counter value of a SYNC message equals the SYNC start value, the first SYNC message is regarded as received. The sync start value must not be changed while the PDO exists. See the SYNC message format in Table 26.

2.3.4.4 PDO parameter mapping record

Each PDO consists of a maximum of 8 bytes of mapped data. To data map the PDO, use a corresponding mapping record that consists of index, sub-index and the length of the mapped object.

Table 24: PDO mapping structure

31	16	15	8	7	0
Index		Sub-index		Length	

To data map the PDOs, first disable the related PDO COB ID in the pre-operational state. In the mapping structure, write the sub-index 0 to zero (number of mapped objects). Then write the mapping structures on the mapping parameter record, starting from the sub-index 1. When you have written all the necessary structures, write the sub-index 0 to correspond to the mapped objects.

Table 25: PDO mapping parameter record

Indexes	Sub-index	Name	Data type	Access
---------	-----------	------	-----------	--------

Table 25: PDO mapping parameter record

0x1600 0x1601 0x1602 0x1A00 0x1A01 0x1A02	0	Number of mapped objects in PDO	UNSIGNED8	r/w
	1	1st object to be mapped	UNSIGNED32	r/w
	2	2nd object to be mapped	UNSIGNED32	r/w
	3	3rd object to be mapped	UNSIGNED32	r/w
	4	4th object to be mapped	UNSIGNED32	r/w

2.3.5 SYNC PROTOCOL

Sync protocol is used by PDOs when the transmission is synchronous. The sync object that is defined by COB ID in the object 0x1005 triggers the transmission of the txPDOs, or activates the previously received data of the rxPDO. At the default sync message the CAN-ID is 0x80. The sync message is a zero-length message but optionally it can consist of an 8bit counter.

Table 26: SYNC message

CAN ID	LENGTH
0x80	0x0

Table 27: SYNC message with counter

CAN ID	LENGTH	DATA0
0x80	0x1	Counter

2.3.5.1 SYNC with counter

When a counter is used in a sync message, the PDOs that have a defined sync start value compare the value against the sync message counter. The sync producer counter will overflow after it reaches the value defined in its 'synchronous counter overflow value' at the object 0x1019. Also, the sync consumer has the object 0x1019 even when the value of itself is ignored. When the value of the sync consumer is greater than zero, the sync counter handling and expecting of the sync messages with counter are activated.

When the sync start value and the sync counter value match, the first sync message is regarded as received.

Table 28: Sync-related object in OD

Index	Description
0x1005	COB ID SYNC
0x1019	Synchronous counter
0x1014	EMCY object COB ID
0x1400	1st rxPDO communication parameter record
0x1401	2nd rxPDO communication parameter record

Table 28: Sync-related object in OD

0x1402	3rd rxPDO communication parameter record
0x1800	1st txPDO mapping parameter record
0x1801	2nd txPDO mapping parameter record
0x1802	3rd txPDO mapping parameter record

2.3.5.2 Device Type

The device type object indicates basic information about the device, including the supported device profile and the profile settings.

Table 29: 0x1000 Device type

Index	Sub-index	Value	Name	Data type	Access
0x1000	-	0x00010192	Device type	UNSIGNED32	const

Value description:

0x0192 = 402 (Drive profile)

0x0001 = Frequency converter with PDO set for a generic drive device

2.3.5.3 Error Register

Error register indicates the active error code.

Table 30: 0x1001 Device type

Index	Sub-index	Value	Name	Data type	Access
0x1001	-	0x0	Error register	UNSIGNED8	const

Meaning of the bits:

0 = generic error

1 = current

2 = voltage

3 = temperature

4 = communication error (overrun, error state)

5 = device profile-specific

6 = reserved

7 = manufacturer-specific

2.3.5.4 Pre-defined Error Field

Pre-defined error field is a list of errors signaled with an EMCY object, listing the error history of up to 9 error entries. Sub-index 1 contains the latest error.

Table 31: 0x1003 Pre-defined error field

Index	Sub-index	Value	Name	Data type	Access
0x1003	0	0x0	Number of errors	UNSIGNED32	ro
	1	0x0	Standard error field	UNSIGNED32	ro
	..	..	..	..	..
	9	0x0	Standard error field	UNSIGNED32	ro

2.3.6 COB ID SYNC

Defines the synchronisation message COB ID. Receiving the sync message causes actions in the PDOs that have a synchronous transmission mode.

Table 32: 0x1005 COB ID sync

Index	Sub-index	Value	Name	Data type	Access
0x1005	-	0x00000080	COB ID sync	UNSIGNED32	r/w

2.3.6.1 Guard Time

The object contains the guard time in milliseconds. As a default, guarding is disabled.

Table 33: 0x100C Guard time

Index	Sub-index	Value	Name	Data type	Access
0x100C	-	0x0000	Guard time	UNSIGNED16	r/w

2.3.6.2 Life Time Factor

Life time factor is used together with guard time, which is multiplied with the life time factor.

Node life time = life time factor x guard time

Table 34: 0x100D Guard time

Index	Sub-index	Value	Name	Data type	Access
0x100D	-	0x00	Guard time	UNSIGNED8	r/w

2.3.7 COB ID EMCY

The object defines the emergency message COB ID.

Table 35: 0x1014 COB ID EMCY

Index	Sub-index	Value	Name	Data type	Access
0x100D	-	0x00000080+ node id	COB ID EMCY	UNSIGNED32	r/w

2.3.7.1 Heartbeat Consumer Entries

The device can act as the heartbeat consumer. Up to 8 devices can be monitored, as defined in the table below. If the heartbeat transmission delay of a defined node ID exceeds the heartbeat time, the error behaviour is activated according to the error behaviour object.

Table 36: 0x1014 Heartbeat consumer entries

Index	Sub-index	Value	Name	Data type	Access
0x1014	0	0x0000 0008	COB ID EMCY	UNSIGNED32	ro
	1	0x0000 0000	Consumer heart beat time 1	UNSIGNED32	r/w
	2	0x0000 0000	Consumer heart beat time 2	UNSIGNED32	r/w
	3	0x0000 0000	Consumer heart beat time 3	UNSIGNED32	r/w
	4	0x0000 0000	Consumer heart beat time 4	UNSIGNED32	r/w
	5	0x0000 0000	Consumer heart beat time 5	UNSIGNED32	r/w
	6	0x0000 0000	Consumer heart beat time 6	UNSIGNED32	r/w
	7	0x0000 0000	Consumer heart beat time 7	UNSIGNED32	r/w
	8	0x0000 0000	Consumer heart beat time 8	UNSIGNED32	r/w

Table 37: Consumer heartbeat time entry

31	24	23	16	15	0
Not used, must be zeroes.		Node ID		Heartbeat time	

2.3.7.2 Producer Heartbeat Time

Heartbeat producer object consists of the time in milliseconds (ms) that it takes to transmit the heartbeat message into the network. If the value is zero, the heartbeat is not used.

Table 38: 0x1017 Producer heartbeat time

Index	Sub-index	Value	Name	Data type	Access
0x1017	-	0x0000	Producer heartbeat time	UNSIGNED16	r/w

Table 39: Heartbeat message

CAN ID	LENGTH	DATA0
0x700 + node	0x1	Node state

2.3.7.3 Identify Object

The object gives information about the option board

Table 40: 0x1018 Identify object

Index	Sub-index	Value	Name	Data type	Access
0x1018	0	0x04	Number of entries	UNSIGNED8	ro
	1	0x90	Vendor ID	UNSIGNED32	ro
	2	0x4536	Product code	UNSIGNED32	ro
	3	-	Revision number	UNSIGNED32	ro
	4	-	Serial number	UNSIGNED32	ro

2.3.7.4 Synchronous counter

The synchronous counter defines whether a counter is mapped into the SYNC message, as well as the highest value the counter can reach. 0 disables the sync counter.

Table 41: 0x1019 Synchronous counter

Index	Sub-index	Value	Name	Data type	Access
0x1019	-	0x00	Synchronous counter	UNSIGNED8	r/w

2.3.7.5 Error behaviour

Error behaviour allows a change in the default error behaviour if there is a communication error.

Table 42: 0x1029 Error behaviour

Index	Sub-index	Value	Name	Data type	Access
0x1019	0	0x01	Number of entries	UNSIGNED8	ro
	1	0x00	Communication error	UNSIGNED8	r/w

Table 43: Error behaviour

Value	Description
0	Pre-operational
1	No change in state
2	Stopped
3..127	Reserved

2.3.8 SAVING AND RESTORING THE OBJECT DICTIONARY

CANopen defines a way of restoring the values in an object dictionary to the defaults and saving the values if the modified values must be valid after the power cycle. The manufacturer-specific bypass configuration can be restored to the object dictionary.

When the object dictionary is saved, the ID of the PDO, EMCY or SYNC COB ID does not change with the node ID. When the default parameters are used, the COB IDs are always calculated according to the node ID.

2.3.8.1 Saving the object dictionary

To save the object dictionary, use the object 0x1010 'Store Parameter Field'.

The option board only saves the parameters in the object dictionary with a command. Autonomous saving is not supported. To save the parameters in the object dictionary, write the value 0x65766173 (ASCII "save") into the sub-index by using the SDO protocol.

Table 44: 0x1010 Save parameter field

Index	Sub-index	Name	Data type	Access
0x1010	0	Highest sub-index supported	UNSIGNED8	ro
	1	Save all parameters	UNSIGNED32	r/w

2.3.8.2 Restoring the object dictionary

The object values of the object dictionary are restored to defaults by using the object 0x1011. Option board supports restoring only for All parameters (sub index 1) and for manufacturer-specific Bypass mode defaults (sub index 4).

To restore parameters, write 0x64616F6C (ASCII "load") into the sub-index by using the SDO protocol.

Table 45: 0x1011 Restore default parameters

Index	Sub-index	Name	Data type	Access
0x1011	0	Highest sub-index supported	UNSIGNED8	ro
	1	Restore all default parameters	UNSIGNED32	r/w
	2	Restore communication default parameters	UNSIGNED32	r/w
	3	Restore application default parameters	UNSIGNED32	r/w
	4	Restore bypass parameter set*	UNSIGNED32	r/w

* Bypass parameter set is used with a drive that has special applications. The bypassed set disables the CIA-402 drive profile and resets the PDO mapping to the vendor specific configuration. See chapter "Bypass parameter set" for more information.

2.3.8.3 Bypass parameter set

Bypass parameter set can be restored to activate direct communication with the application. The CIA-402 state machine and the related objects are bypassed. The bypass set is used with special drive applications.

NOTE! When the bypass parameter set is restored, the COB IDs are calculated according to the table below. After the bypass parameter set is used, the node ID change does not affect the COB IDs.

Table 46: Overview of bypass RX PDO configuration

Object	COB ID	Size	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7
RPD01	0x200 +node ID	6	FB PD in offset 0		FB PD in offset 1		FB PD in offset 2			
RPD02	0x300 +node ID	8	FB PD in offset 3		FB PD in offset 4		FB PD in offset 5		FB PD in offset 6	
RPD03	0x400 +node ID	8	FB PD in offset 7		FB PD in offset 8		FB PD in offset 9		FB PD in offset 10	

Table 47: Overview of bypass TX PDO configuration

Object	COB ID	Size	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7
TPD01	0x180 +node ID	6	FB PD in offset 0		FB PD in offset 1		FB PD in offset 2			
TPD02	0x280 +node ID	8	FB PD in offset 3		FB PD in offset 4		FB PD in offset 5		FB PD in offset 6	
TPD03	0x380 +node ID	8	FB PD in offset 7		FB PD in offset 8		FB PD in offset 9		FB PD in offset 10	

Configuration of the receive PDO mapping, when the bypass parameter set is restored, is the following:

Table 48: Receive PDO 1

Index	Sub-index	Value	Name	Data type	Access
0x1600	0	3	Number of entries	UNSIGNED8	r/w
	1	0x20000110	FB PD In Offset 0*	UNSIGNED32	r/w
	2	0x20000210	FB PD In Offset 1*	UNSIGNED32	r/w
	3	0x20000310	FB PD In Offset 2*	UNSIGNED32	r/w

Table 49: Receive PDO 2

Index	Sub-index	Value	Name	Data type	Access
0x1601	0	4	Number of entries	UNSIGNED8	r/w
	1	0x20000410	FB PD In Offset 3*	UNSIGNED32	r/w
	2	0x20000510	FB PD In Offset 4*	UNSIGNED32	r/w
	3	0x20000610	FB PD In Offset 5*	UNSIGNED32	r/w
	4	0x20000710	FB PD In Offset 6*	UNSIGNED32	r/w

Table 50: Receive PDO 3

Index	Sub-index	Value	Name	Data type	Access
0x1602	0	4	Number of entries	UNSIGNED8	r/w
	1	0x20000810	FB PD In Offset 7*	UNSIGNED32	r/w
	2	0x20000910	FB PD In Offset 8*	UNSIGNED32	r/w
	3	0x20000A10	FB PD In Offset 9*	UNSIGNED32	r/w
	4	0x20000B10	FB PD In Offset 10*	UNSIGNED32	r/w

* Data inside 'FB PD In' vary according to the drive application. For further information, see Application Manual.

Configuration of the receive PDO parameter, when the bypass parameter set is restored, is the following:

Table 51: Receive PDO 1 communication parameter record

Index	Sub-index	Value	Name	Data type	Access
-------	-----------	-------	------	-----------	--------

Table 51: Receive PDO 1 communication parameter record

0x1400	0	5	Highest sub-index	UNSIGNED8	ro
	1	0x00000200+id	COB-ID	UNSIGNED32	r/w
	2	0xFE	Transmission type	UNSIGNED8	r/w
	3	0x03E8	Inhibit time	UNSIGNED16	r/w
	4	-	Reserved	UNSIGNED8	ro
	5	0x0	Event timer	UNSIGNED16	r/w

Table 52: Receive PDO 2 communication parameter record

Index	Sub-index	Value	Name	Data type	Access
0x1401	0	5	Highest sub-index	UNSIGNED8	ro
	1	0x00000300+id	COB-ID	UNSIGNED32	r/w
	2	0xFE	Transmission type	UNSIGNED8	r/w
	3	0x03E8	Inhibit time	UNSIGNED16	r/w
	4	-	Reserved	UNSIGNED8	ro
	5	0x0	Event timer	UNSIGNED16	r/w

Table 53: Receive PDO 3 communication parameter record

Index	Sub-index	Value	Name	Data type	Access
0x1401	0	5	Highest sub-index	UNSIGNED8	ro
	1	0x00000400+id	COB-ID	UNSIGNED32	r/w
	2	0xFE	Transmission type	UNSIGNED8	r/w
	3	0x03E8	Inhibit time	UNSIGNED16	r/w
	4	-	Reserved	UNSIGNED8	ro
	5	0x0	Event timer	UNSIGNED16	r/w

Configuration of the transmit PDO mapping, when the bypass parameter set is restored, is the following:

Table 54: Transmit PDO 1 mapping entry

Index	Sub-index	Value	Name	Data type	Access
0x1A00	0	3	Number of entries	UNSIGNED8	r/w
	1	0x20010110	FB PD Out Offset 0*	UNSIGNED32	r/w
	2	0x20010210	FB PD Out Offset 1*	UNSIGNED32	r/w
	3	0x20010310	FB PD Out Offset 2*	UNSIGNED32	r/w

Table 55: Transmit PDO 2 mapping entry

Index	Sub-index	Value	Name	Data type	Access
0x1A01	0	4	Number of entries	UNSIGNED8	r/w
	1	0x20010410	FB PD Out Offset 3*	UNSIGNED32	r/w
	2	0x20010510	FB PD Out Offset 4*	UNSIGNED32	r/w
	3	0x20010610	FB PD Out Offset 5*	UNSIGNED32	r/w
	4	0x20010710	FB PD Out Offset 6*	UNSIGNED32	r/w

Table 56: Transmit PDO 3 mapping entry

Index	Sub-index	Value	Name	Data type	Access
0x1A02	0	4	Number of entries	UNSIGNED8	r/w
	1	0x20010810	FB PD Out Offset 7*	UNSIGNED32	r/w
	2	0x20010910	FB PD Out Offset 8*	UNSIGNED32	r/w
	3	0x20010A10	FB PD Out Offset 9*	UNSIGNED32	r/w
	4	0x20010B10	FB PD Out Offset 10*	UNSIGNED32	r/w

* Data inside 'FB PD Out' vary according to the drive application. For further information, see Application Manual.

Configuration of the transmit PDO parameter, when the bypass parameter set is restored, is the following:

Table 57: Transmit PDO 1 communication parameter record

Index	Sub-index	Value	Name	Data type	Access
0x1800	0	6	Highest sub-index	UNSIGNED8	ro
	1	0x00000180+id	COB-ID	UNSIGNED32	r/w
	2	0xFE	Transmission type	UNSIGNED8	r/w
	3	0x03E8	Inhibit time	UNSIGNED16	r/w
	4	-	Reserved	UNSIGNED8	ro
	5	0x0	Event timer	UNSIGNED16	r/w
	6	0x0	Sync start value	UNSIGNED8	w

Table 58: Transmit PDO 2 communication parameter record

Index	Sub-index	Value	Name	Data type	Access
0x1801	0	6	Highest sub-index	UNSIGNED8	ro
	1	0x00000280+id	COB-ID	UNSIGNED32	r/w
	2	0xFE	Transmission type	UNSIGNED8	r/w
	3	0x03E8	Inhibit time	UNSIGNED16	r/w
	4	-	Reserved	UNSIGNED8	ro
	5	0x0	Event timer	UNSIGNED16	r/w
	6	0x0	Sync start value	UNSIGNED8	w

Table 59: Transmit PDO 3 communication parameter record

Index	Sub-index	Value	Name	Data type	Access
0x1802	0	5	Highest sub-index	UNSIGNED8	ro
	1	0x00000400+id	COB-ID	UNSIGNED32	r/w
	2	0xFE	Transmission type	UNSIGNED8	r/w
	3	0x03E8	Inhibit time	UNSIGNED16	r/w
	4	-	Reserved	UNSIGNED8	ro
	5	0x0	Event timer	UNSIGNED16	r/w
	6		Sync start value	UNSIGNED8	w

3. CANOPEN OPTION BOARD OPTe6 - TECHNICAL DATA

3.1 GENERAL

CAN bus electrical isolation	500 VDC	
Ambient temperature	As specified in drive specification (-10°C ... 40°C)	
Storing temperature	As specified in drive specification (-40°C ... 70°C)	
Humidity	0-95%, non-condensing, corrosive	
Vibration and electrical safety	EN 61800-5-1 (2007) 5... 15,8 Hz 1mm (peak) 15,8 ...150 Hz 1 G	
Emission	C2 level, EN 61800-3 (2004)	
Immunity	C2 level, EN 61800-3 (2004)	
CAN Interface	Isolation	2500 V rms isolation with a less than 10-ns propagation delay
	Protection	±8kV ESD IEC 61000-4-2 Contact Discharge ±80V Fault Protection greater than ±12V common Mode Range

Table 60. Technical data of CANopen option board

3.2 CAN CABLE

The recommended cables for installations are 4 wires twisted and a shielded cable with an impedance of 120 Ohm. The network topology is a 2-wire bus line that is terminated at both ends by resistors representing the characteristic impedance of the bus line. The typical CAN cable impedance is 120 Ohm, and so for the termination resistors of ~120 Ohm must be used. For long networks a higher resistor value must be used (150-300 Ohm).

Cable length	Max bit rate [kbit/s]	Max cable resistance [mΩ/m]
0-40 m	1000	Max 70
100 m	500	<60
500 m	100	<40
1 km	50	<26

Table 61. Bus parameter relation to cable length

3.2.1 ISOLATED GROUND CONNECTION

The OPTE6 option board is galvanically isolated. In CANopen networks that are completely galvanically isolated the CAN ground signal is carried in the cable line. It is connected at only one point into common ground potential. If one CAN device with not galvanically isolated interface is connected to the network, the potential for isolated CAN ground is given. Therefore only one device with not galvanically isolated interface may be connected to the network.

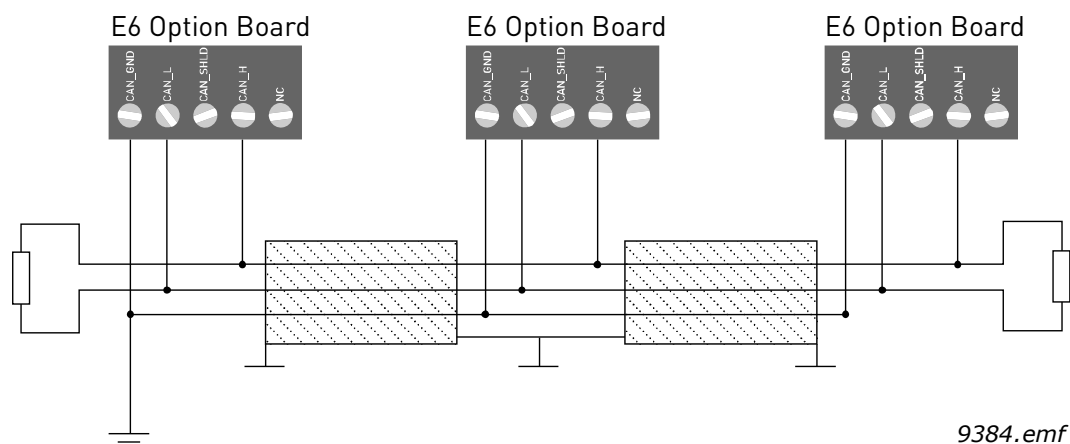


Figure 2. Completely isolated nodes

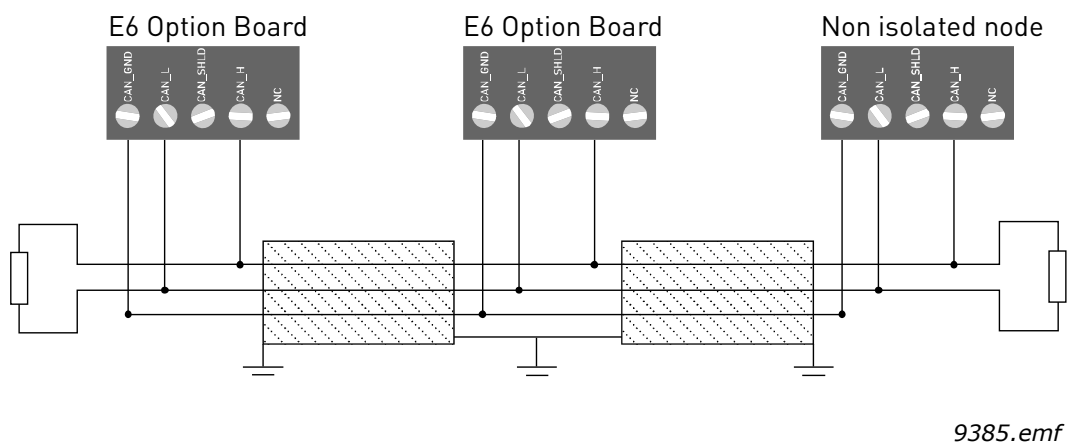


Figure 3. CAN network with one non-isolated node

3.2.2 RECOMMENDED CABLE

For all OPTE6 installations the use of 4-wire cable is recommended. 4 wires enable the connection of isolated digital grounds with nodes.

Vacon recommends the following cable:

UNITRONIC® BUS CAN FD P

Colour-coded in accordance with DIN 47100



Figure 4. Recommended cable

Table 62. Cable thickness, length and baud rate relation

Bit rate	Min cable thickness					
1 Mbit/s	0,25					
500 kbit/s	0,25	0,34				
250 kbit/s	0,25	0,34	0,6			
125 kbit/s	0,25	0,34	0,6			
100 kbit/s	0,25	0,34	0,6	0,6		
50 kbit/s	0,25	0,34	0,6	0,6		
20 kbit/s	0,25	0,34	0,6	0,6	0,75	
10 kbit/s	0,25	0,34	0,6	0,6	0,75	0,75
Cable length	25	100	250	500	600	1000

4. OPTE6 LAYOUT AND CONNECTIONS

4.1 LAYOUT AND CONNECTIONS

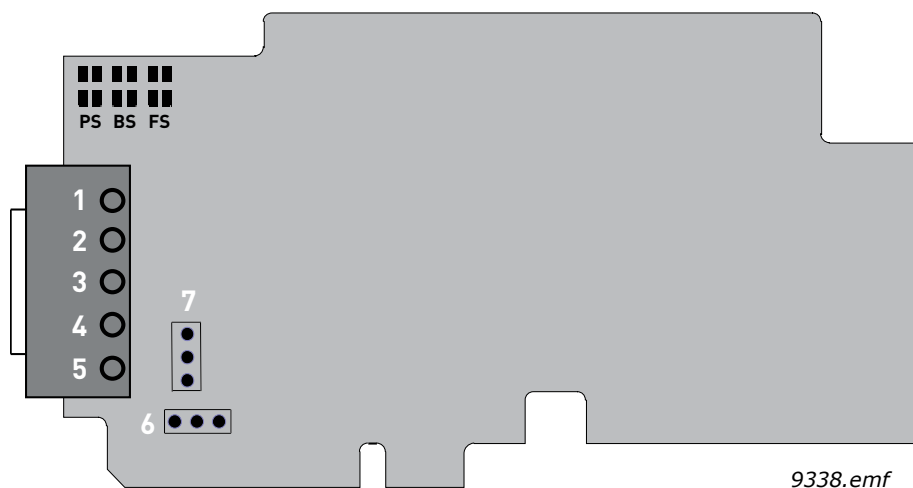


Figure 5. OPTE6 board layout

- 1 = CAN GND (isolated digital ground reference)
- 2 = CAN L
- 3 = SHIELD (shield connector)
- 4 = CAN H
- 5 = NC (No connection)
- 6 = Grounding option jumper
- 7 = Bus termination resistor

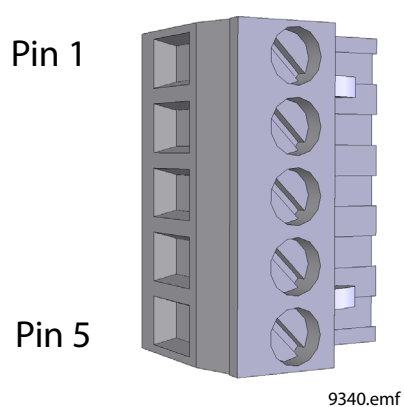


Figure 6. CAN connector

CAN connector pinout

Pin out	
1	CAN GND, isolated digital ground reference
2	CAN LO
3	Shield connector
4	CAN HI
5	No connection

4.2 LED INDICATIONS

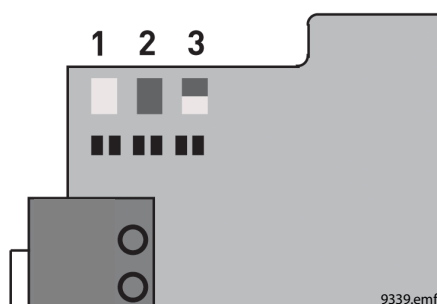


Figure 7. LED indicators

1 = CANopen run led

2 = CANopen err led

3 = Board status

CANopen run led (green)

LED is	Description
Blinking	The CANopen device is in the pre-operational state.
Single flash	The CANopen device is in the stopped state.
ON	The CANopen device is in the operational state.

CANopen err led (red)

LED is	Description
OFF	No error
Blinking	Invalid configuration
Single flash	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames).
Double flash	A guard event (NMT slave or NMT master) or a heartbeat event (heartbeat consumer) has occurred.
Quadruple flash	An expected PDO was not received before the event timer elapsed.
ON	The CAN controller is bus-off.

4.3 JUMPERS

The jumper settings and the ground shielding options of OPTe6 are shown in the Figures 9 and 10 below. See the jumper and shield locations on the board in Figure 5.

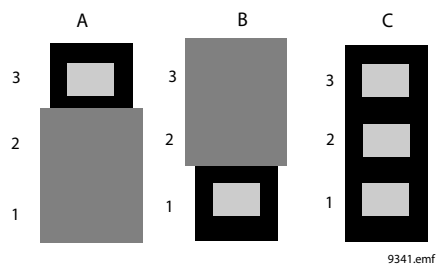


Figure 8. CAN bus termination jumper

A = Termination resistor 120 Ohm connected

B and C = No termination resistor

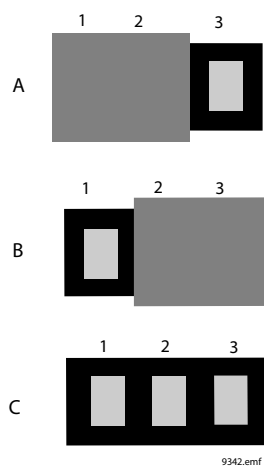


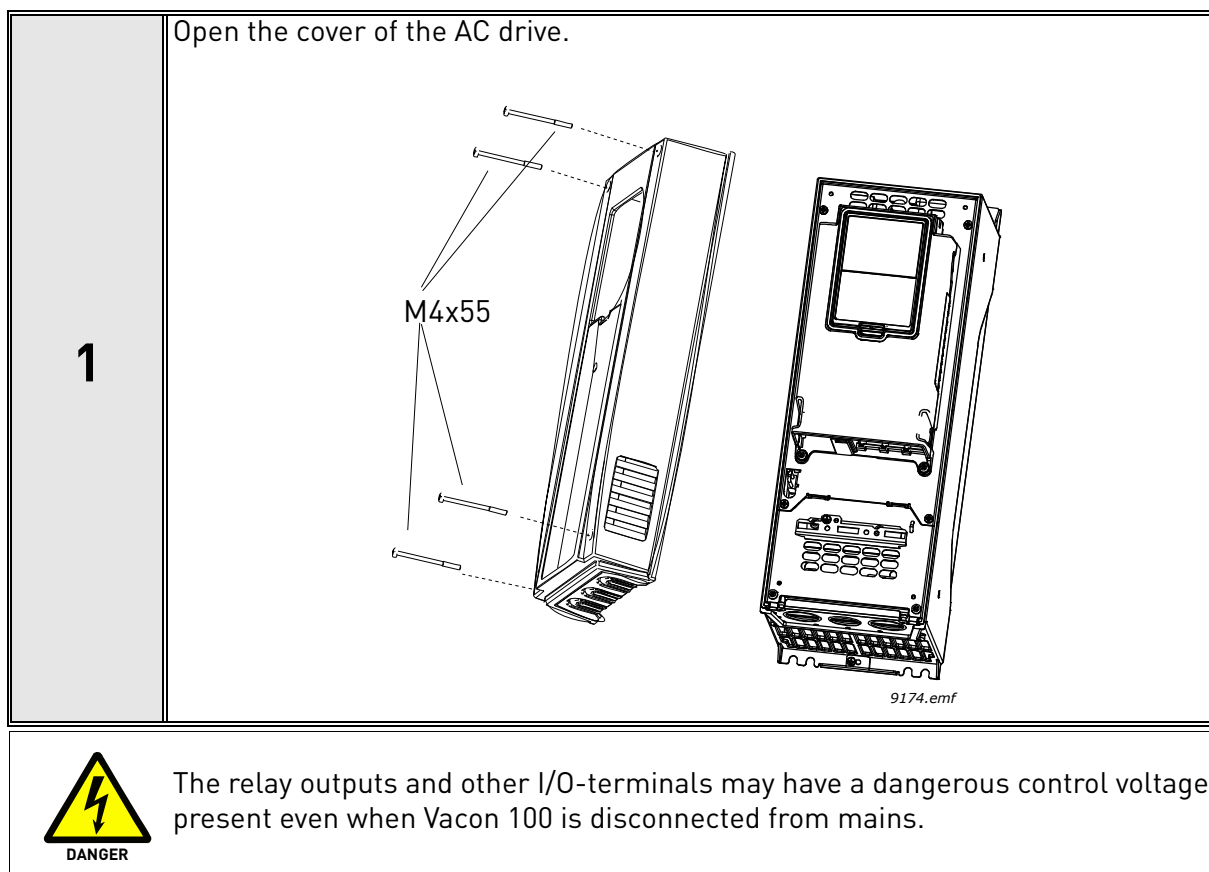
Figure 9. CAN shield grounding option

A = CAN connector pin 3 connected to the drive chassis with a high-impedance RC circuit

B = CAN connector pin 3 connected directly into the chassis

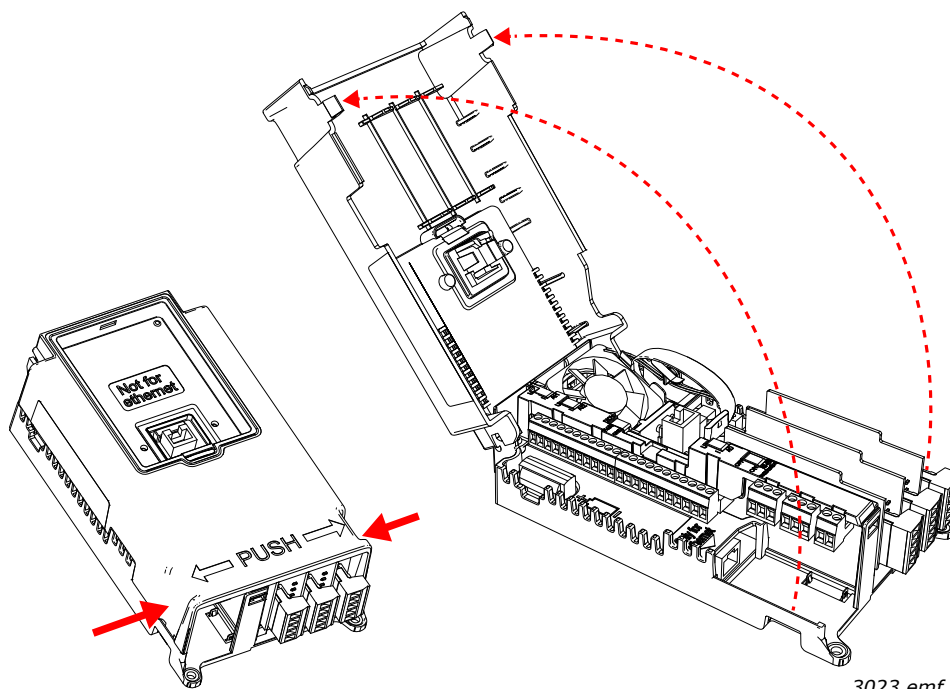
C = No connection

4.4 INSTALLATION IN VACON 100



2

Open the inner cover to reveal the option board slots (C,D,E). See Figure below.

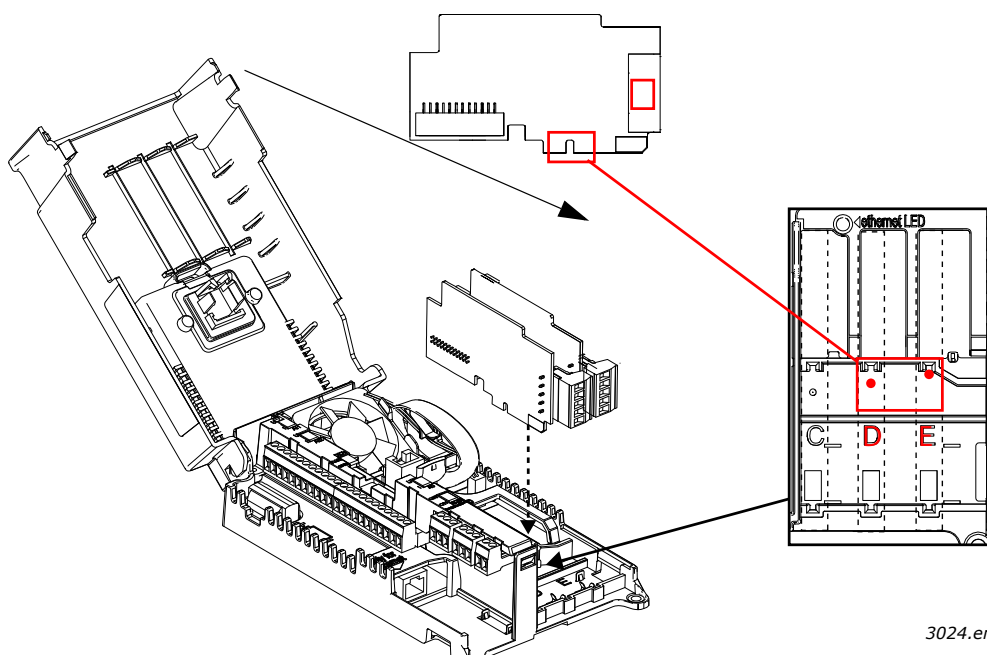


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3

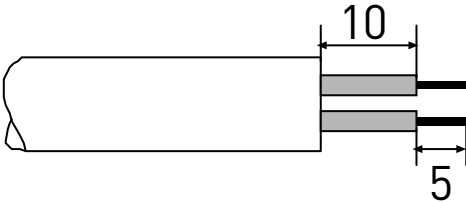
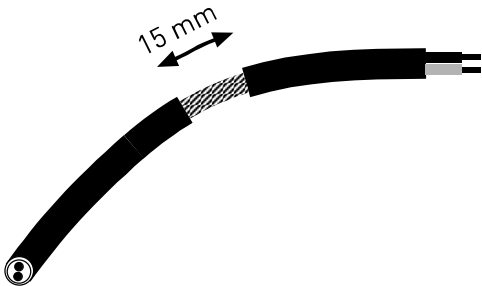
Install the fieldbus board into slot D or E. See figure below.

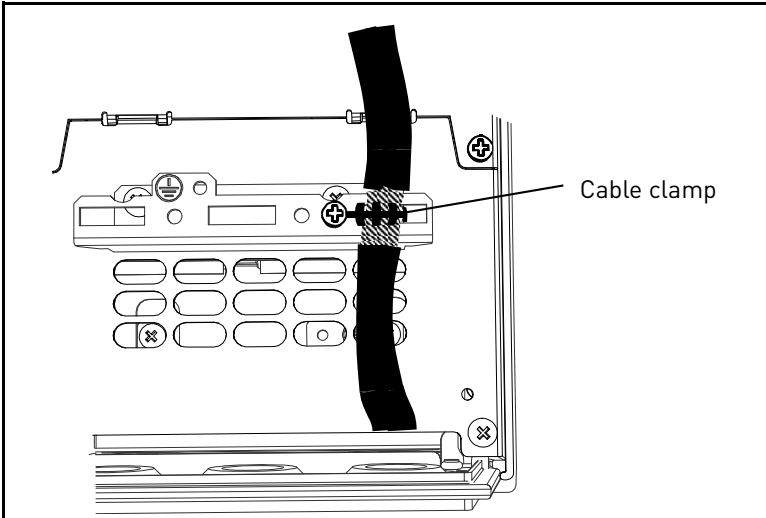
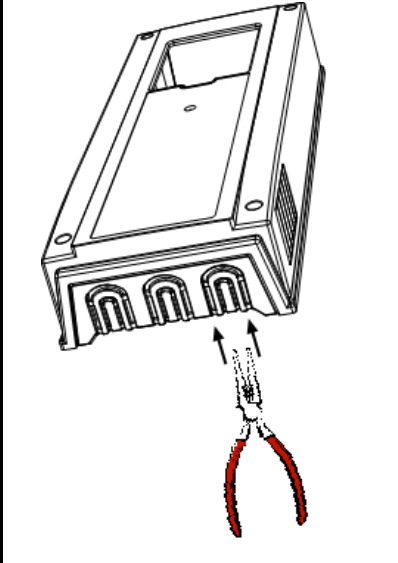
NOTE: Incompatible boards cannot be installed on Vacon 100. Compatible boards have a slot coding that enable the placing of the board.



3024.emf

4.5 PREPARE FOR USE THROUGH FIELDBUS

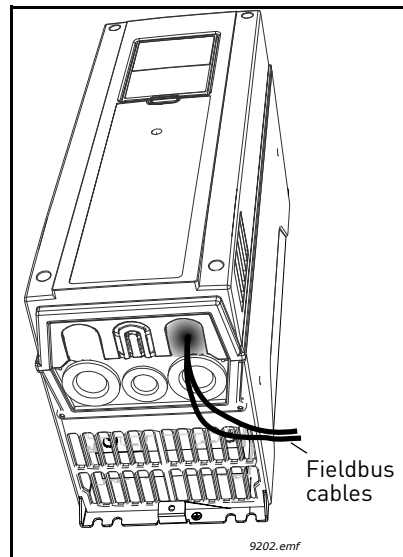
4	Strip about 15 mm of the fieldbus cable (see specification in ch. 3.2) and cut off the grey cable shield. Remember to do this for both bus cables (except for the last device). Leave no more than 10 mm of the cable outside the terminal block and strip the cables at about 5 mm to fit in the terminals. See picture below.  Also strip the cable now at such a distance from the terminal that you can fix it to the frame with the grounding clamp. Strip the cable at a maximum length of 15 mm. Do not strip the aluminum cable shield! 
5	Then connect the cable to its appropriate terminals on the OPTE6 CANopen option board terminal block.

6	Using the cable clamp included in the delivery of the drive, ground the shield of the CAN cable to the frame of the AC drive. NOTE: This can be done in all drives if there is no difference in PE potential between the drives. However, if there is PE potential difference then the shield should be connected to PE only at one point in the system. The shields of the cables shall be joint but not connected to several PE points with different potential.  The diagram shows a cross-section of an AC drive with a CAN cable shield being connected to the drive's frame using a cable clamp. The clamp is secured with a screw. A label 'Cable clamp' points to the connection point. The drive's internal components, including a terminal block and various connectors, are visible.
7	If the AC drive is the last device on the bus, the bus termination must be set with jumper X13 (see ch. 4.3.)
8	Unless already done for the other control cables, cut free the opening on the AC drive cover for the fieldbus cable (protection class IP21). NOTE: Cut the opening on the same side you have installed the board in!  The diagram shows a 3D perspective of the AC drive's cover. A pair of red-handled pliers is shown at the bottom, with arrows indicating the removal of a cover plate from the bottom of the drive. The cover plate has several mounting tabs.

9

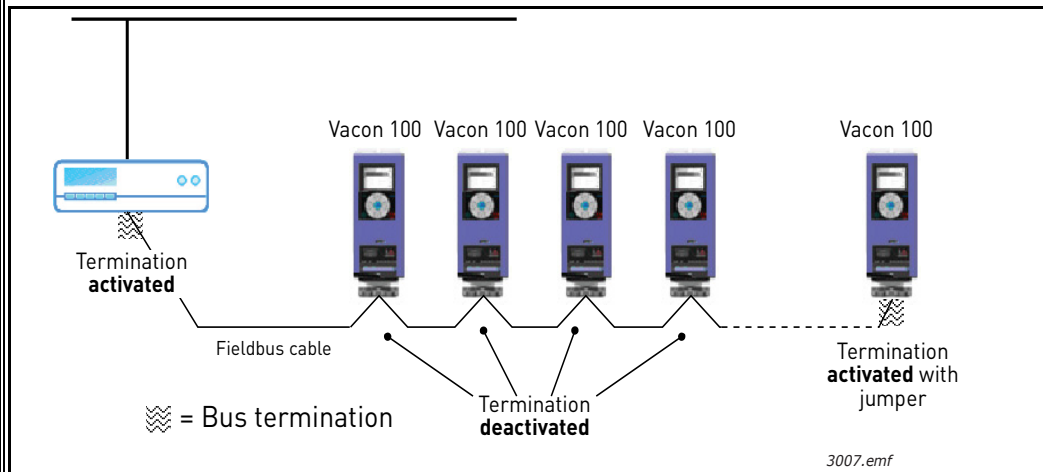
Remount the AC drive cover and run the cable as shown in picture.

NOTE: When planning the cable runs, remember to keep the distance between the fieldbus cable and the motor cable at a **minimum of 30 cm**. It is recommended to route the option board cables away from the power cables as shown in the picture.



10

The bus termination must be set for the first and the last device of the fieldbus line. See picture below. See also step 7 on page 35. We recommend that the first device on the bus and, thus, terminated was the Master device.



5. COMMISSIONING

5.1 OPTE6 PANEL PARAMETERS

When OPTE6 board is attached to a drive, 3 basic communication parameters will appear on the panel menu. The parameters are saved automatically when changed.

NOTE! The parameters are saved into the memory of the frequency controller, which must be noted, if the board is moved into another drive.

Table 63. OPTE6 board parameters

Index	Parameter	Min	Max	Default	Description
1	Node ID	1	127	1	Network-wide unique identifier for each CANOpen device
2	Bitrate	3	8	5	Data signalling rate. Should be the same on each node in the same bus.
3	Operate Mode	1	2	1	Selection between a CIA-402 drive profile and a manufacturer-specific bypass mode.

Table 64. OPTE6 board monitoring values

Index	Monitoring value	Description
1	CANOpen Status	A running counter for incoming messages combined with node CANOpen status (see the description below)

5.1.1 PARAMETER DESCRIPTIONS

CANOpen Status: indicates the NMT state of CANOpen.

CANOpen Status is in the following format:

NNNN.S

where NNNNN is the counter for received messages and S is the CANOpen status.

Table 65: CANOpen status

Value	Description
0	Initialising
4	Stopped
5	Operational
6	Pre-operational
7	Reset application
8	Reset communication

Operate Mode: is used to change the modes of operation between the velocity mode of the CIA-402 drive profile and the manufacturer-specific bypass mode.

Table 66: Operate mode

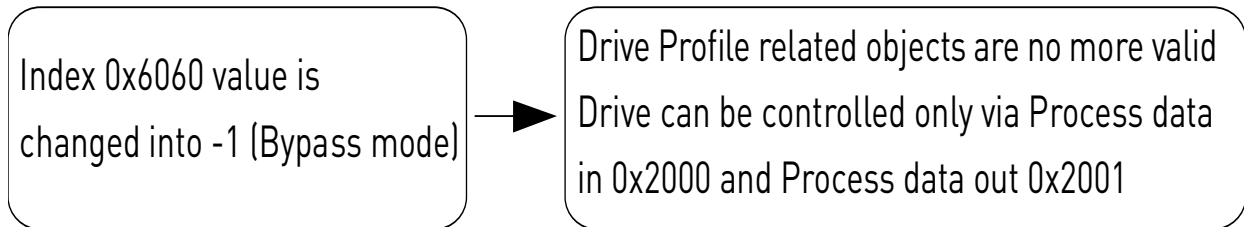
Value	Name	Description
1	Drive Profile	CIA-402 drive profile, velocity mode active

Table 66: Operate mode

2	Bypass	Manufacturer-specific bypass mode active
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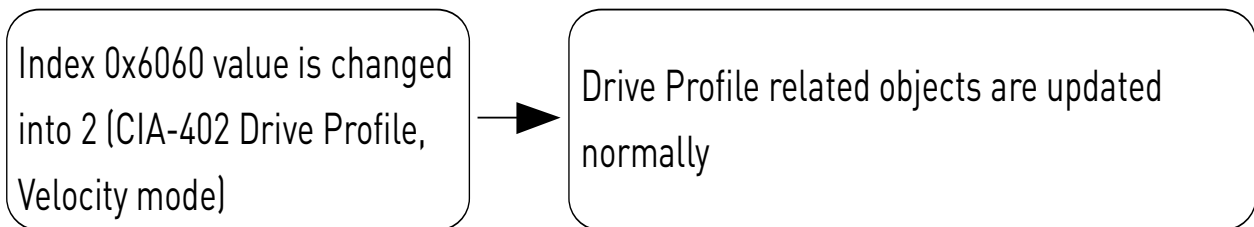
Figure 10 and Figure 11 describe the outputs when you change the parameter.

Figure 10. Value changed from Drive Profile to Bypass mode



9386.emf

Figure 11. Value changed from Bypass mode into Drive profile



9387.emf

Node ID: can be set to values 1-127.

Bit Rate: is used in CANopen communication. Regardless of the selected bitrate, the bit sample timing is set as close as possible to 87,5 % according to the CANopen specification.

Table 67: The available bit rates

Value	Bit rate
3	50 kbit/s
4	100 kbit/s
5	125 kbit/s
6	250 kbit/s
7	500 kbit/s
8	1000 kbit/s

6. CANOPEN OPTION BOARD INTERFACE

By default, the CANopen option board is configured to operate in Drive Profile mode. The drive profile implementation is 'Velocity Mode' which is defined in CiA 402 specification with PDO set for frequency controller. The board can also be configured into Manufacturer specific mode.

6.1 SUPPORTED DRIVE MODES

Table 68. Drive modes

Value	Mode name	Description
2	Velocity Mode	The CiA 402 Drive Profile mode where the control of the drive is done using a control word and speed reference value as specified in the drive profile specification.
-1	Bypass mode	In this mode, the Drive control can be done using raw process data which is exchanged with drive application. The drive profile state machine and the related objects become invalid.

Table 69. Operating mode related objects

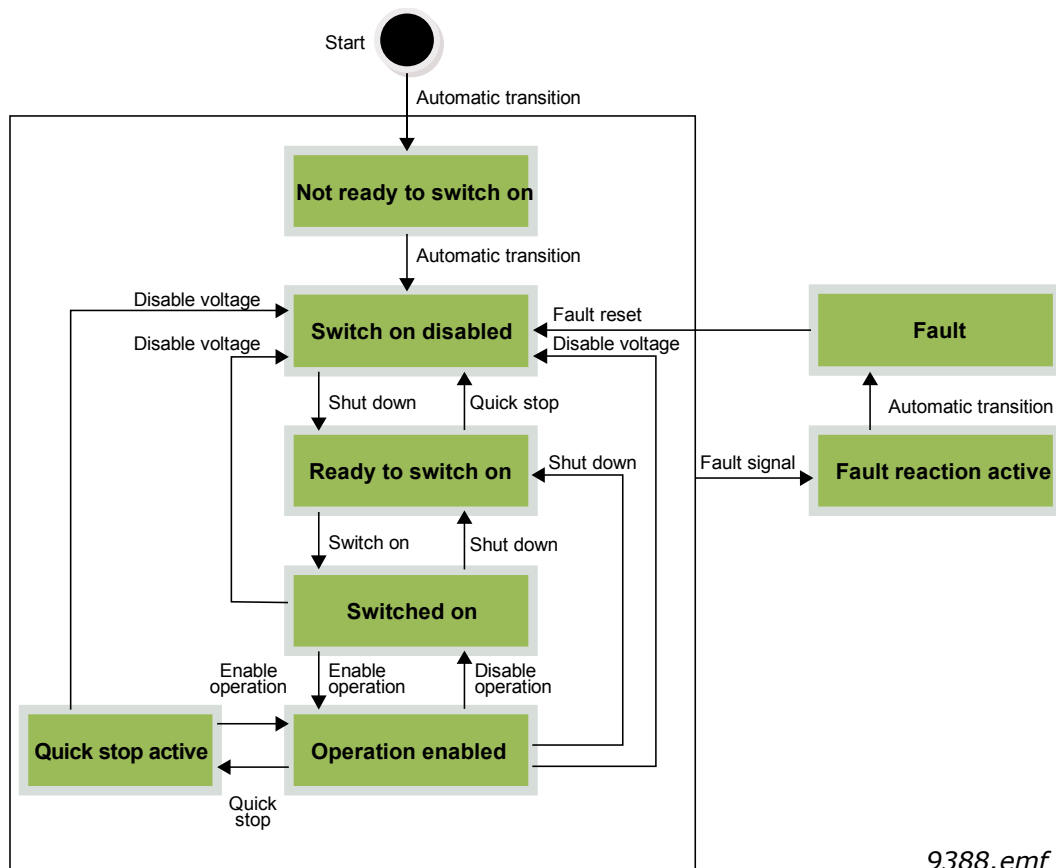
Index	Description
0x6060	Modes of operation
0x6061	Modes of Operation Display
0x6502	Supported Drive Modes

6.2 VELOCITY MODE

The velocity mode is one of the specific modes that CIA-402 Drive Profile defines. Common behaviour in all modes are PDS state machine, some control and status bits and certain objects.

6.2.1 PDS STATE MACHINE

The PDS state machine describes the generic start and stop sequence of the drive and the error behavior. The state machine is controlled by the Controlword object and internal events.



9388.emf

Figure 12. Power Drive System state machine

	Control word				
	Bit7	Bit3	Bit2	Bit1	Bit0
Shutdown	0	x	1	1	0
Switch on	0	0	1	1	1
Switch on + enable op	0	1	1	1	1
Disable voltage	0	x	x	0	x
Quick stop	0	x	0	1	x
Disable operation	0	0	1	1	1
Enable operation	0	1	1	1	1
Fault reset	↑	x	x	x	x

	Status word						
	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Not ready to switch on	0	x	x	0	0	0	0
Switch on disabled	1	x	x	0	0	0	0
Ready to switch on	0	1	x	0	0	0	1
Switched on	0	1	x	0	0	0	1
Operation enabled	0	1	x	0	1	1	1
Quick stop active	0	0	x	0	1	1	1
Fault reaction active	0	x	x	1	1	1	1
Fault	0	x	x	1	0	0	0

6.2.2 CONTROLWORD

Controlword is used to control the drive operation according to the PDS state machine. By default, Controlword is mapped into the first two bytes of rxPD01.

Table 70. 0x6040:Controlword

Bit	Name	Description
9-15		not used
8	h	Halt
7	fr	Fault reset
4-6		not used
3	eo	Enable operation
2	qs	Quick stop
1	ev	Enable voltage
0	so	Switch on

6.2.3 STATUSWORD

Statusword indicates whether the drive is in remote control and if the target velocity is reached. By default, Statusword is mapped into the first two bytes of txPD01.

Table 71. 0x6041:Statusword

Bit	Name	Description
11-15		not used
10	tr	Target reached
9	rm	Remote
7-8		not used
6	sod	Switch on disabled
5	qs	Quick stop
4	ve	Voltage enabled
3	f	Fault
2	oe	Operation enabled
1	so	Switched on
0	rtso	Ready to switch on

6.2.4 VL TARGET VELOCITY

The signed value of motor rpm speed request to drive. A negative value means that the motor is running clockwise. By default, the object is mapped into the first two bytes of rxPD01.

Range: -32768...32767

0x6042:vl Target Velocity		
15		0
Rpm request to drive		

6.2.5 VL VELOCITY DEMAND

The signed read-only value of the ramp generator output scaled into rpm. A negative value means that the motor is running clockwise. By default, the object is not mapped into any PDO.

Range: -32768...32767

0x6043:vl Velocity Demand		
15		0
Drive ramp generator output scaled into rpm		

6.2.6 VL VELOCITY ACTUAL VALUE

The signed value of the motor actual rpm speed. A negative value means that the motor is running clockwise. By default, the object is mapped into the last two bytes of txPD01.

Range: -32768...32767

0x6044:vl Velocity Actual Value		
15		0
Motor actual rpm speed		

6.2.7 ABORT CONNECTION OPTION CODE

A CIA-402 related object which defines the action performed when one of the following errors occur: buss-off, heartbeat, life guarding, NMT stopped state, reset application or reset communication.

0x6007:Abort connection option code		
15		0
Abort Connection option code		

Table 72. 0x6007:Abort connection option code value description

Value	Description Velocity mode (default)
0	No action
1	Malfunction (fault)
2	Disable Voltage command
3	Quick stop command

6.2.8 BYPASS MODE

In bypass mode, some data defined in the profile is invalid, and the drive control is done using raw process data. The raw process data arrays are located in the manufacturer specific objects 0x2000 and 0x2001. There are two arrays: one for incoming data and one for outgoing data. The drive application defines which one is mapped into the process data.

Table 73. Process data in

Index	Sub index	Name	Data type	Access
0x2000	0	Number of entries	UNSIGNED16	ro
	1	PB PD In Offset 0	UNSIGNED16	r/w
	2	PB PD In Offset 1	UNSIGNED16	r/w
	3	PB PD In Offset 2	UNSIGNED16	r/w
	4	PB PD In Offset 3	UNSIGNED16	r/w
	5	PB PD In Offset 4	UNSIGNED16	r/w
	6	PB PD In Offset 5	UNSIGNED16	r/w
	7	PB PD In Offset 6	UNSIGNED16	r/w
	8	PB PD In Offset 7	UNSIGNED16	r/w
	9	PB PD In Offset 8	UNSIGNED16	r/w
	10	PB PD In Offset 9	UNSIGNED16	r/w
	11	PB PD In Offset 10	UNSIGNED16	r/w

Table 74. Process data out

Index	Sub index	Name	Data type	Access
0x2001	0	Number of entris	UNSIGNED16	ro
	1	FB PD Out Offset 0	UNSIGNED16	ro
	2	FB PD Out Offset 1	UNSIGNED16	ro
	3	FB PD Out Offset 2	UNSIGNED16	ro
	4	FB PD Out Offset 3	UNSIGNED16	ro
	5	FB PD Out Offset 4	UNSIGNED16	ro
	6	FB PD Out Offset 5	UNSIGNED16	ro
	7	FB PD Out Offset 6	UNSIGNED16	ro
	8	FB PD Out Offset 7	UNSIGNED16	ro
	9	FB PD Out Offset 8	UNSIGNED16	ro
	10	FB PD Out Offset 9	UNSIGNED16	Ro
	11	FB PD Out Offset 10	UNSIGNED16	Ro

6.3 DEFAULT PROCESS DATA APPLICATION MAPPING

This chapter describes the default mapping of the OPTE6 process data variables to the application data in the drive. It also provides a description of the application data in the drive. Please read also the corresponding section of the drive's application manual for additional information.

Table 75. Process data in

Name	Mapped Application data
FB PD In Offset0	FB Control word
PB PD In Offset 1	FB Control word Extension
PB PD In Offset 2	FB Speed reference
PB PD In Offset 3	FB Process data in 01
PB PD In Offset 4	FB Process data in 02
PB PD In Offset 5	FB Process data in 03
PB PD In Offset 6	FB Process data in 04
PB PD In Offset 7	FB Process data in 05
PB PD In Offset 8	FB Process data in 06
PB PD In Offset 9	FB Process data in 07
PB PD In Offset 10	FB Process data in 08

Table 76. Process data out

Name	Mapped Application data
FB PD Out Offset 0	FB Status Word
FB PD Out Offset 1	FB Status Word Extension
FB PD Out Offset 2	FB Actual Speed
FB PD Out Offset 3	FB Process data out 01
FB PD Out Offset 4	FB Process data out 02
FB PD Out Offset 5	FB Process data out 03
FB PD Out Offset 6	FB Process data out 04
FB PD Out Offset 7	FB Process data out 05
FB PD Out Offset 8	FB Process data out 06
FB PD Out Offset 9	FB Process data out 07
FB PD Out Offset 10	FB Process data out 08

6.3.1 FB CONTROL WORD

Mapped into FB PD in offset 0.

Table 77. FB Control Word

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	-	-	ESTP	JOG2	JOG1	BREF	BCTRL	ZREF	FRMP	ZRMP	STPM2	STPM1	FRST	DIR	STRT

Table 78. FB Control Word description

Bit	Name	Description	0	1
12	ESTP	Emergency Stop	-	Emergency stop
11	JOG2	Jogging request	-	Select ref2 jogging
10	JOG1	Jogging request	-	Select ref1 jogging

Bit		Name	Description	0	1
9	BREF	Bus Reference	Force Reference to fieldbus	Selected reference place	Force Fieldbus reference
8	BCTRL	Bus Control	Force fieldbus control active	Selected control place	Force Fieldbus Control
7	ZREF	Zero Ref	Force reference to zero	-	Force reference to zero
6	FRMP	Ramp Freeze	Freeze ramp generator	-	Freeze ramp generator
5	ZRMP	Zero Ramp	Force ramp to zero	-	Ramp time to zero
4	STPM2	Stop Mode2	Stop mode ramping	-	Stop By Ramp mode
3	STPM1	Stop Mode1	Stop mode coasting	-	Coasting Stop Mode
2	FRST	Fault Reset	Request fault reset from drive	-	Request reset from drive
1	DIR	Direction	Rotation direction	Clockwise	Counter clockwise
0	STRT	Start / Stop	Start / Stop request	Stop	Run

6.3.2 FB CONTROL WORD EXTENSION (GENERAL CONTROL WORD)

Mapped into FB PD in offset 1.

Table 79. FB Control Word Extension

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
BSTAT2	BSTAT1	BFLT	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 80. FB Control Word extension description

Bit		Name	Description	0	1
15	BSTAT2	Bus status	Informs bus status into application	Status of option board	
14	BSTAT1	Bus status	Informs bus status into application		
13	BFLT	Bus fault	Request fieldbus fault	-	Generate field bus fault

6.3.3 FB SPEED REFERENCE

Mapped into FB PD in offset 2.

Table 81. FB Speed Reference

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FB Speed Reference															

Table 82. FB Speed reference description

Name	Description	Min	Max
FB Speed Reference	Frequency reference at percentage between minimum and maximum frequency. A negative value means inverted direction.	-10000 (-100.00%)	10000 (100.00%)

6.3.4 FB PROCESS DATA 1...8

Mapped into FB PD in offset 3...11.

Table 83. FB Process Data 1...8

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FB Process data in															

6.3.5 FB PROCESSDATA INPUT MAPPING IN APPLICATION

Table 84. FB Processdata application mapping

PD	Mapped Application Data	Unit
PD in 1	-	-
PD in 2	-	-
PD in 3	-	-
PD in 4	-	-
PD in 5	-	-
PD in 6	-	-
PD in 7	-	-
PD in 8	-	-

6.3.6 FB STATUS WORD

Mapped into FB PD out offset 0.

Table 85. FB Status Word

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CP3	CP2	CP1	-	-	-	-	-	FRDY	ZSPD	ATREF	ALARM	FLT	DIR	RUN	RDY

Table 86. FB Status word description

Bit		Name	Description	0	1
15	CP3	Control Place	Drive Control place information	0,0,1- (1) Fieldbus 0,1,0- (2) Panel 0,1,1 - (3) Tool 1,0,0 - (4) I/O	
14	CP2				
13	CP1				
...					
7	FRDY	Flux ready	Motor magnetization is ready	-	Flux ready
6	ZSPD	Zero speed	Motor is running on zero speed	-	Zero speed condition
5	ATREF	At reference	Reference frequency is reached	-	Reference reached
4	ALARM	Alarm	Alarm indication	-	Drive is in Alarm
3	FLT	Faulted	Drive fault indicatioin	-	Drive is Faulted
2	DIR	Direction	Motor running direction	Clockwise	Counter clockwise
1	RUN	Run	Motor running information	Stopped	Running
0	RDY	Ready	Drive readiness information	-	Ready

6.3.7 FB STATUS WORD EXTENSION (GENERAL STATUS WORD)

Mapped into FB PD in offset 1.

Currently not used in standard applications.

Table 87. FB Status word extension

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

6.3.8 FB ACTUAL SPEED

Mapped into FB PD in offset 2.

Table 88. FB Actual Speed

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FB Actual Speed															

Table 89. FB Actual Speed description

Name	Description	Min	Max
FB Actual Speed	Actual output frequency at percentage between minimum and maximum frequency. A negative value means inverted direction.	-10000 [-100.00%]	10000 [100.00%]

6.3.9 FB PROCESSDATA OUT 1...8

Mapped into FB PD out offset 3...11

Table 90. FB Process data 1...8

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FB Process data Out 1...8															

6.3.10 FB PROCESSDATA OUTPUT MAPPING IN APPLICATION

Table 91. Process data output application mapping

PD	Mapped Application Data	Unit	Scale
PD Out 1	Output Frequency	Hz	0,01Hz
PD Out 2	Motor Speed	Rpm	1rpm
PD Out 3	Motor Current	A	0,1A
PD Out 4	Motor Torque	%	0,1%
PD Out 5	Motor Power	%	0,1%
PD Out 6	Motor Voltage	V	0,1V
PD Out 7	DC Link Voltage	V	1V
PD Out 8	Active Fault Code	-	-

6.4 EXCEPTION WHEN USING BYPASS MODE

When using bypass mode, the profile objects listed in table Objects disabled at bypass mode are invalid and do not contain valid data.

Table 92. Objects disabled at bypass mode

Index	Description
0x6040	Controlword
0x6041	Statusword
0x6042	VI Target Velocity
0x6043	VI Velocity Demand
0x6044	VI Velocity Actual Value

Note! At bypass mode, the 0x6007 object behavior is changed as indicated in the following tables.

Table 93. Object behaviour changes after bypass mode

Index	Description
0x6007	Abort Connection Option Code

Value	Description	
	Velocity mode (default)	Bypass mode
0	No action	No action
1	Malfunction (fault)	Malfunction (fault)
2	Disable voltage command	Malfunction (fault)
3	Quick stop command	Malfunction (fault)

7. APPENDIX A: OBJECT DICTIONARY

7.1 COMMUNICATION SEGMENT

Index	Sub-index	Description	Object Code	Data Type	Access	PDO Mapping	Default value	Unit
Object 1000h: Device Type								
1000	0	Device type	Variable	UNSIGNED32	CONST	No	0x00010192	
Object 1001h: Error Register								
1001	0	Error Register	Variable	UNSIGNED8	R0	No	0x00	
Object 1003h: Pre-defined Error Field								
1003		Pre-defined Error Field	Array	UNSIGNED32				
	000	Number of Errors			RW	No	0x00000000	
	001	Standard Error Field		UNSIGNED32	R0	No	0x00000000	
	002	Standard Error Field		UNSIGNED32	R0	No	0x00000000	
	003	Standard Error Field		UNSIGNED32	R0	No	0x00000000	
	004	Standard Error Field		UNSIGNED32	R0	No	0x00000000	
	005	Standard Error Field		UNSIGNED32	R0	No	0x00000000	
	006	Standard Error Field		UNSIGNED32	R0	No	0x00000000	
	007	Standard Error Field		UNSIGNED32	R0	No	0x00000000	
	008	Standard Error Field		UNSIGNED32	R0	No	0x00000000	
	009	Standard Error Field		UNSIGNED32	R0	No	0x00000000	
Object 1005h: COB-ID SYNC								
1005	0	COB-ID SYNC	Variable	UNSIGNED32	RW	No	0x00000080	
Object 100Ch: Guard Time								
100C	0	Guard Time	Variable	UNSIGNED16	RW	No	0x00000000	ms
Object 100Dh: Life Time Factor								
100D	0	Life Time Factor	Variable	UNSIGNED8	RW	No	0x00000000	
Object 1010h: Store Parameter Field								
1010		Store Parameter Field	Array	UNSIGNED32				
	000	Number of Entries			R0	No	0x2	
	001	Save all Parameters		UNSIGNED32	RW	No	-	
	002	Save Communication Parameters		UNSIGNED32	RW	No	-	
Object 1011h: Restore Default Parameters								

Index	Sub-index	Description	Object Code	Data Type	Access	PDO Mapping	Default value	Unit
1011		Restore Default Parameters	Array	UNSIGNED32				
	000	Number of Entries			RO	No	0x4	
	001	Restore all Default Parameters		UNSIGNED32	RW	No	-	
	002	Restore Communication Default Parameters		UNSIGNED32	RW	No	-	
	003	Restore Application Default Parameters		UNSIGNED32	RW	No	-	
	004	Restore Bypass parameter set		UNSIGNED32	RW	No	-	
Object 1014h: COB-ID EMCY								
1014	0	COB-ID EMCY	Variable	UNSIGNED32	RW	No	0x80	
Object 1016h: Heartbeat Consumer Entries								
1016		Heartbeat Consumer Entries	Array	UNSIGNED32				
	000	Number of Entries			RO	No	0x08	
	001	Consumer Heartbeat Time 1		UNSIGNED32	RW	No	0x00000000	
	002	Consumer Heartbeat Time 2		UNSIGNED32	RW	No	0x00000000	
	003	Consumer Heartbeat Time 3		UNSIGNED32	RW	No	0x00000000	
	004	Consumer Heartbeat Time 4		UNSIGNED32	RW	No	0x00000000	
	005	Consumer Heartbeat Time 5		UNSIGNED32	RW	No	0x00000000	
	006	Consumer Heartbeat Time 6		UNSIGNED32	RW	No	0x00000000	
	007	Consumer Heartbeat Time 7		UNSIGNED32	RW	No	0x00000000	
	008	Consumer Heartbeat Time 8		UNSIGNED32	RW	No	0x00000000	
Object 1017h: Producer Heartbeat Time								
1017	0	Producer Heartbeat Time	Variable	UNSIGNED16	RW	No	0x00000000	
Object 1018h: Identity Object								
1018		Identity Object	Record	IDENTITY				
	000	number of entries			RO	No	0x4	
	001	Vendor Id		UNSIGNED32	RO	No	0x90	
	002	Product Code		UNSIGNED32	RO	No	-	
	003	Revision number		UNSIGNED32	RO	No	0x01	
	004	Serial number		UNSIGNED32	RO	No	-	
Object 1019h: Synchronous counter								
1019	0	Synchronous counter	Variable	UNSIGNED8	RW	No	0x00000000	
Object 1029h: Error Behaviour								
1029		Error Behaviour	Array	UNSIGNED8				
	000	Number of Entries			RO	No	0x1	
	001	Communication Error		UNSIGNED8	RW	No	0x0	
Object 1400h: Receive PDO Communication Parameter 1								

Index	Sub-index	Description	Object Code	Data Type	Access	PDO Mapping	Default value	Unit
1400		Receive PDO Communication Parameter 1	Record	PDO_COMM_PAR				
	000	Number of Entries			R0	No	0x05	
	001	COB-ID		UNSIGNED32	RW	No	0x200	
	002	Transmission Type		UNSIGNED8	RW	No	0xFE	
	003	Inhibit Time		UNSIGNED16	RW	No	0x0	100 µs
	004	Compatibility Entry		UNSIGNED8	RW	No	0x00	
	005	Event Timer		UNSIGNED16	RW	No	0x0	ms
Object 1401h: Receive PDO Communication Parameter 2								
1401		Receive PDO Communication Parameter 2	Record	PDO_COMM_PAR				
	000	Number of Entries			R0	No	0x05	
	001	COB-ID		UNSIGNED32	RW	No	0x80000300	
	002	Transmission Type		UNSIGNED8	RW	No	0xFE	
	003	Inhibit Time		UNSIGNED16	RW	No	0x0	100 µs
	004	Compatibility Entry		UNSIGNED8	RW	No	0x00	
	005	Event Timer		UNSIGNED16	RW	No	0x0	ms
Object 1402h: Receive PDO Communication Parameter 3								
1402		Receive PDO Communication Parameter 3	Record	PDO_COMM_PAR				
	000	Number of Entries			R0	No	0x05	
	001	COB-ID		UNSIGNED32	RW	No	0x80000400	
	002	Transmission Type		UNSIGNED8	RW	No	0xFE	
	003	Inhibit Time		UNSIGNED16	RW	No	0x0	100 µs
	004	Compatibility Entry		UNSIGNED8	RW	No	0x00	
	005	Event Timer		UNSIGNED16	RW	No	0x0	ms
Object 1600h: Receive PDO Mapping Parameter 1								
1600		Receive PDO Mapping Parameter 1	Record	PDO_MAPPING				
	000	Number of Entries			RW	No	0x02	
	001	Mapping Entry 1		UNSIGNED32	RW	No	0x60400010	
	002	Mapping Entry 2		UNSIGNED32	RW	No	0x60420010	
	003	Mapping Entry 3		UNSIGNED32	RW	No	0x00000000	
	004	Mapping Entry 4		UNSIGNED32	RW	No	0x00000000	
Object 1601h: Receive PDO Mapping Parameter 2								
1601		Receive PDO Mapping Parameter 2	Record	PDO_MAPPING				
	000	Number of Entries			RW	No	0x04	
	001	Mapping Entry 1		UNSIGNED32	RW	No	0x20000410	
	002	Mapping Entry 2		UNSIGNED32	RW	No	0x20000510	
	003	Mapping Entry 3		UNSIGNED32	RW	No	0x20000610	
	004	Mapping Entry 4		UNSIGNED32	RW	No	0x20000710	

Index	Sub-index	Description	Object Code	Data Type	Access	PDO Mapping	Default value	Unit
Object 1602h: Receive PDO Mapping Parameter 3								
1602		Receive PDO Mapping Parameter 3	Record	PDO_MAPPING				
	000	Number of Entries			RW	No	0x04	
	001	Mapping Entry 1		UNSIGNED32	RW	No	0x20000810	
	002	Mapping Entry 2		UNSIGNED32	RW	No	0x20000910	
	003	Mapping Entry 3		UNSIGNED32	RW	No	0x20000A10	
	004	Mapping Entry 4		UNSIGNED32	RW	No	0x20000B10	
Object 1800h: Transmit PDO Communication Parameter 1								
1800		Transmit PDO Communication Parameter 1	Record	PDO_COMM_PAR				
	000	Number of Entries			RO	No	0x06	
	001	COB-ID		UNSIGNED32	RW	No	0x180	
	002	Transmission Type		UNSIGNED8	RW	No	0xFE	
	003	Inhibit Time		UNSIGNED16	RW	No	0x64	100 µs
	004	Compatibility Entry		UNSIGNED8	RW	No	0x00	
	005	Event Timer		UNSIGNED16	RW	No	0x0	ms
	006	Sync start value		UNSIGNED8	RW	No	0x0	
Object 1801h: Transmit PDO Communication Parameter 2								
1801		Transmit PDO Communication Parameter 2	Record	PDO_COMM_PAR				
	000	Number of Entries			RO	No	0x06	
	001	COB-ID		UNSIGNED32	RW	No	0x80000280	
	002	Transmission Type		UNSIGNED8	RW	No	0xFE	
	003	Inhibit Time		UNSIGNED16	RW	No	0x3E8	100 µs
	004	Compatibility Entry		UNSIGNED8	RW	No	0x00	
	005	Event Timer		UNSIGNED16	RW	No	0x0	ms
	006	Sync start value		UNSIGNED8	RW	No	0x0	
Object 1802h: Transmit PDO Communication Parameter 3								
1802		Transmit PDO Communication Parameter 3	Record	PDO_COMM_PAR				
	000	Number of Entries			RO	No	0x06	
	001	COB-ID		UNSIGNED32	RW	No	0x80000380	
	002	Transmission Type		UNSIGNED8	RW	No	0xFE	
	003	Inhibit Time		UNSIGNED16	RW	No	0x3E8	100 µs
	004	Compatibility Entry		UNSIGNED8	RW	No	0x00	
	005	Event Timer		UNSIGNED16	RW	No	0x0	ms
	006	Sync start value		UNSIGNED8	RW	No	0x0	
Object 1A00h: Transmit PDO Mapping Parameter 1								

Index	Sub-index	Description	Object Code	Data Type	Access	PDO Mapping	Default value	Unit
1A00		Transmit PDO Mapping Parameter 1	Record	PDO_MAPPING				
	000	Number of Entries			RW	No	0x02	
	001	Mapping Entry 1		UNSIGNED32	RW	No	0x60410010	
	002	Mapping Entry 2		UNSIGNED32	RW	No	0x60440010	
	003	Mapping Entry 3		UNSIGNED32	RW	No	0x00000000	
	004	Mapping Entry 4		UNSIGNED32	RW	No	0x00000000	
Object 1A01h: Transmit PDO Mapping Parameter 2								
1A01		Transmit PDO Mapping Parameter 2	Record	PDO_MAPPING				
	000	Number of Entries			RW	No	0x04	
	001	Mapping Entry 1		UNSIGNED32	RW	No	0x20010410	
	002	Mapping Entry 2		UNSIGNED32	RW	No	0x20010510	
	003	Mapping Entry 3		UNSIGNED32	RW	No	0x20010610	
	004	Mapping Entry 4		UNSIGNED32	RW	No	0x20010710	
Object 1A02h: Transmit PDO Mapping Parameter 3								
1A02		Transmit PDO Mapping Parameter 3	Record	PDO_MAPPING				
	000	Number of Entries			RW	No	0x04	
	001	Mapping Entry 1		UNSIGNED32	RW	No	0x20010810	
	002	Mapping Entry 2		UNSIGNED32	RW	No	0x20010910	
	003	Mapping Entry 3		UNSIGNED32	RW	No	0x20010A10	
	004	Mapping Entry 4		UNSIGNED32	RW	No	0x20010B10	

7.2 MANUFACTURER SEGMENT

Index	Sub-index	Description	Object Code	Data Type	Access	PDO Mapping	Default value	Unit
Object 2000h: FB Processdata In								
2000		FB Processdata In	Array	UNSIGNED16				
	000	Number of Entries			CONST	No	0xB	
	001	FB PD In Offset 0		UNSIGNED16	RWW	Yes	0x0	
	002	FB PD In Offset 1		UNSIGNED16	RWW	Yes	0x0	
	003	FB PD In Offset 2		UNSIGNED16	RWW	Yes	0x0	
	004	FB PD In Offset 3		UNSIGNED16	RWW	Yes	0x0	
	005	FB PD In Offset 4		UNSIGNED16	RWW	Yes	0x0	
	006	FB PD In Offset 5		UNSIGNED16	RWW	Yes	0x0	
	007	FB PD In Offset 6		UNSIGNED16	RWW	Yes	0x0	
	008	FB PD In Offset 7		UNSIGNED16	RWW	Yes	0x0	
	009	FB PD In Offset 8		UNSIGNED16	RWW	Yes	0x0	
	010	FB PD In Offset 9		UNSIGNED16	RWW	Yes	0x0	
	011	FB PD In Offset 10		UNSIGNED16	RWW	Yes	0x0	
Object 2001h: FB Processdata Out								
2001		FB Processdata Out	Array	UNSIGNED16				
	000	Number of Entries			CONST	No	0xB	
	001	FB PD Out Offset 0		UNSIGNED16	RO	Yes	0x0	
	002	FB PD Out Offset 1		UNSIGNED16	RO	Yes	0x0	
	003	FB PD Out Offset 2		UNSIGNED16	RO	Yes	0x0	
	004	FB PD Out Offset 3		UNSIGNED16	RO	Yes	0x0	
	005	FB PD Out Offset 4		UNSIGNED16	RO	Yes	0x0	
	006	FB PD Out Offset 5		UNSIGNED16	RO	Yes	0x0	
	007	FB PD Out Offset 6		UNSIGNED16	RO	Yes	0x0	
	008	FB PD Out Offset 7		UNSIGNED16	RO	Yes	0x0	
	009	FB PD Out Offset 8		UNSIGNED16	RO	Yes	0x0	
	010	FB PD Out Offset 9		UNSIGNED16	RO	Yes	0x0	
	011	FB PD Out Offset 10		UNSIGNED16	RO	Yes	0x0	

The objects from 0x2100 to 0x5FFF contain the device-specific parameters and monitoring values. These can be found in a separate .EDS file which can be downloaded from www.vacon.com.

7.3 DEVICE PROFILE SEGMENT

Index	Sub-index	Description	Object Code	Data Type	Access	PDO Mapping	Default Value
Object 6007h: Abort Connection Option Code							
6007	0	Abort Connection Option Code	Variable	INTEGER16	RW	No	0x0001
Object 6040h: Controword							
6040	0	Controlword	Variable	UNSIGNED16	RWW	Yes	-
Object 6041h: Statusword							
6041	0	Statusword	Variable	UNSIGNED16	RO	Yes	-
Object 6042h: vL Target Velocity							
6042	0	vL Target Velocity	Variable	INTEGER16	RWW	Yes	0x0000
Object 6043h: vL Velocity Demand							
6043	0	vL Velocity Demand	Variable	INTEGER16	RO	Yes	-
Object 6044h: vL Velocity Actual Value							
6044	0	vL Velocity Actual Value	Variable	INTEGER16	RO	Yes	-
Object 6046h: vL Velocity Min Max Amount							
6046		vL Velocity Min Max Amount	Array	UNSIGNED32			
	000	Number of Entries		CONST		No	0x00000002
	001	vL_Velocity_Min_Amount		UNSIGNED32	RW	No	-
	002	vL_Velocity_Max_Amount		UNSIGNED32	RW	No	-
Object 6048h: vL Velocity Acceleration							
6048		vL Velocity Acceleration	Record	P402_VL_VEL_ACC_T			
	000	NumOfEntries		CONST		No	0x2
	001	DeltaSpeed		UNSIGNED32	RW	No	0x0
	002	DeltaTime		UNSIGNED16	RW	No	0x0
Object 6049h: vL Velocity Deceleration							
6049		vL Velocity Deceleration	Record	P402_VL_VEL_ACC_T			
	000	NumOfEntries		CONST		No	0x2
	001	DeltaSpeed		UNSIGNED32	RW	No	0x0
	002	DeltaTime		UNSIGNED16	RW	No	0x0
Object 604Ah: vL Velocity Quick Stop							
604A		vL Velocity Quick Stop	Record	P402_VL_VEL_ACC_T			
	000	NumOfEntries		CONST		No	0x2
	001	DeltaSpeed		UNSIGNED32	RW	No	0x0
	002	DeltaTime		UNSIGNED16	RW	No	0x0
Object 6060h: Modes of Operation							
6060	0	Modes of Operation	Variable	INTEGER8	RW	No	-
Object 6061h: Modes of Operation Display							
6061	0	Modes of Operation Display	Variable	INTEGER8	RO	No	-
Object 6502h: Supported Drive Modes							
6502	0	Supported Drive Modes	Variable	UNSIGNED32	RO	No	-



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Manual authoring:
documentation@vacon.com

Vacon Plc.
Runsorintie 7
65380 Vaasa
Finland

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